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Addendum
REPORT # 1299

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MSTS TEST REPORT ADDENDUM

RUNS 95-423, 424, 425, 426-SP2-31

SPECIAL TEST 2

CONVAIR
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SEP 4 1959

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~~CONFIDENTIAL~~ UNCLASSIFIEDSECTION 1Summary

Runs 95-423, 424, 425, and 426-SP2-S1 were satisfactorily performed at TS 1-95 on 4, 5, and 6 August 1959. These runs fulfilled the requirements of special test SP2. F

The engine LO2 tank fill times and discussion may be found in the original EM 1299 report.

LO2 and fuel were loaded at IOC rates on all four runs. The Acoustica PLCS properly controlled the loading sequence during Runs 424 and 426. The fuel 90% probe signalled RAPID LOAD STOP before the fuel rapid load valve opened during Run 423. Fuel rapid loading was continued manually. The LO2 90% probe signalled RAPID LOAD STOP at approximately 68% LO2 tank level during rapid loading on Run 425. LO2 rapid loading was continued manually. GO2 samples were taken during LO2 tanking and detanking periods for determination of GN2 contamination during Runs 423, 424 and 425, but not during Run 426.

Booster helium bottle temperature and pressure requirements for 65-2 were achieved during Run 423. This was the fourth consecutive run on which 65-2 requirements have been achieved. Helium load start was delayed 3 minutes after FUEL LOAD START, as planned. The average temperature attained during Run 423 at 13.0 minutes was -299 DGF with 3060 PSIG in the booster helium bottles and with the LN2 high flow rate less than 86 GPM. The characteristic droop in booster bottle pressure was repeated during this run prior to the PS-80 cutoff point, recovering to 3060 PSIG at 11.9 minutes. Helium loading was not attempted during Run 424, but LN2 was loaded to simulate engine compartment environment. Helium and LN2 loading were not attempted during Runs 425 and 426.

The LO2 topping valve did not open during Run 423 due to rust in the valve positioner, caused by condensation. The LO2 Recirculator In temperature (P1925T) rose above -291 DGF at 11.5 minutes and remained above that temperature until drain start. The LO2 topping valve remained full open (25 to 28 GPM) during the LO2 topping hold on Runs 424 and 425. The LO2 Recirculator In temperature (P1925T) rose above -291 DGF from 12.0 to 13.0 minutes during Run 424 with a maximum temperature of -289 DGF. The temperature remained warmer than -291 DGF between 13.0 and 13.4 minutes during Run 425 with a maximum temperature of -290 DGF. The LO2 topping valve was not opened until 14.3 minutes during Run 426 and remained full open (25 to 28 GPM) until 20.25 minutes. The LO2 Recirculator In temperature (P1925T) rose above -291 DGF at 11.5 minutes and remained there until 17.6 minutes.

Sequence III pressurization was not initiated during these runs. Tank pressures were maintained within the prescribed limits in all other sequences.

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Summary (Continued)

The LO2 boiloff valve P/N 27-80588-811 operated satisfactorily during Run 423. However, during Runs 424, 425 and 426, the LO2 boiloff valve closed light on the panel failed to cycle during initial tanking when visual observation indicated that the valve cycled. This problem is under investigation.

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SECTION 2

Fuel Loading System

The Fuel Loading System loaded satisfactorily at IOC flow rates during Runs 423, 424, 425 and 426. The fuel rapid load valve was opened manually by the console operator during Run 423 due to a premature Acoustica 90% fuel probe pickup, preventing the rapid load valve from opening in automatic sequence.

The following table summarizes the fuel loading system data and additional data for Runs 423 and 424 are shown in Figures 1 and 2.

<u>Run No.</u>	<u>Termination Time</u>	<u>Max. Flow Rate</u>	<u>Max Weight Loaded</u>
423	6.62	*4600	76,860
424	6.78	*4600	76,920
425	6.75	*4600	76,960
426	**6.15	*4600	76,910

* Calculated over one minute interval from FUEL TANK HD (U1902P)

** Fuel load termination time less than normal due to the fuel cone not being drained prior to Run 426.

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SECTION 3

Liquid Oxygen Loading System

The LO2 Loading System satisfactorily performed loading at IOC flow rates during Runs 423, 424, 425 and 426. The LO2 rapid load valve closed at 9.20 minutes during Run 425 (approximately the 68% LO2 level) when the 90% Acoustica LO2 probe picked up prematurely. The rapid load valve was opened at 9.43 minutes manually by the console operator and loading continued. See the Report EM 1299 for detailed discussion of the engine LO2 tank fill time.

The following table summarizes the LO2 Loading System data.

<u>Run No.</u>	<u>Termination Time</u>	<u>Max. Flow Rate</u>	<u>Max. Weight Loaded</u>
423	11.85	*5900	175,140
424	11.42	*5900	172,540
425	**12.12	*5900	172,630
426	11.13	*5900	172,630

* Calculated over one minute interval from LO2 TK HD (U1901P).

** LO2 load termination time more than normal due to the LO2 rapid load valve closing for 0.23 minutes during rapid load.

LO2 Topping Systems

The LO2 Topping System performance was unsatisfactory during Run 423. The LO2 topping valve did not open due to rust in the valve positioner, caused by condensation. The valve positioner was reworked prior to Run 424. The LO2 Recirculator In temperature (P1925T) rose above -291 DGF at 11.5 minutes and remained above that temperature until start of LO2 drain during Run 423.

The performance of the LO2 Topping System during Runs 424, 425 and 426 was satisfactory. The LO2 topping valve on Run 424 remained full open (25 GPM) during the thirteen minute topping hold because LO2 LOAD STOP was signalled by the 99% LO2 level probe. The weight increase of LO2 was 1,020 pounds during the hold. The LO2 Recirculator Intemperature (P1925T) rose above -291 DGF at 12.0 minutes and remained until 13.0 minutes. The maximum temperature reached was -289 DGF.

The LO2 topping valve remained full open (28 GPM) on Run 425, throughout the run and the 6.5 minute LO2 topping hold. The LO2 Recirculator In temperature (P1925T) remained warmer than -291 DGF from 13.0 to 13.4 minutes with a maximum temperature of -290 DGF.

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The LO2 topping valve was not opened until 14.3 minutes during Run 426 and remained open until 20.25 minutes (maximum flow rate 28 GPM). The LO2 Recirculator In temperature (F1925T) rose above -291 DOF at 11.5 minutes and remained warmer than this temperature until 17.6 minutes.

See graphic presentation for details on LO2 Recirculator In temperature (F1925T) for Runs 423, 424, 425 and 426 (Figures 5, 6, 7 and 8).

CO2 Sampling System:

CO2 samples were taken during LO2 tanking and detanking on Runs 423, 424 and 425, but not on Run 426.

The samples during Runs 423, 424 and 425 were taken at specified levels for determination of GN2 contamination. See Table 1.

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SECTION 4

HE/LN2 LOADING SYSTEM

HE/LN2 system performance was satisfactory during Run 423. Booster bottle temperature and pressure requirements for 65-2 were achieved during this run. Helium load start was delayed 3 minutes after fuel load start as planned. This is the fourth consecutive run on which 65-2 requirements have been achieved. LN2 high flow rate was lowered to 86 GPM for this run. The LN2 storage tank pressure was 88 PSIG.

The upper and lower booster bottle temperatures at 13 minutes were -295 DGF and -304 DGF respectively. The lower bottle temperature (F1297T) indicated -326 DGF just prior to helium dump. This is an impossible value, although it repeats data acquired during Run 422. This discrepancy is well within allowable instrumentation error and the data can be considered reliable. Even if an arbitrary correction factor of + 5 DGF is applied to all values of this parameter, the data remains reasonable through the run and 65-2 requirements have still been achieved.

The characteristic droop in booster bottle pressure was repeated during this run. The attempt to remedy the problem by manually exercising PT-21 just prior to the run did not achieve the desired results. This problem is still under investigation.

The inline heat exchanger performance was satisfactory. Two of the three temperature measurements required for an evaluation of the heat exchanger (F1744T and F1910T) were obtained. Helium temperature at the stub-up (F1894T) was not obtained due to excessive recorder noise during the run. The heat exchanger is still under evaluation. See Figure 9 for heat exchanger data.

HE/LN2 system performance was satisfactory during Run 424 although helium loading was not attempted. The bottles were precharged to a low pressure (to prevent formation of a vacuum) and LN2 was loaded to simulate engine compartment atmosphere.

HE/LN2 loading was not attempted on Runs 425 and 426.

See Table 2 and time slice tab for HE/LN2 data.

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SECTION 5

Convair Propellant Loading Control System

Convair PLCU System:

The Convair Propellant Loading Control System was not installed for these runs. The unit was IR'd prior to Run 419 and has been sent to San Diego. The fuel density was 50.2 on Test 425 and 426. No fuel samples were taken on Runs 423 and 424 so a fuel density of 50.3 lbs. per cu. ft. was assumed.

Convair PU System:

The Convair PU system operated in an open loop configuration during Run 425 through 426. The error ratio demod signal (U1091V) agreed within 1% to the other level sensing systems at the 90% level but showed a 4% error at the 100% level. This error at the 100% level is due to calibration setting of the PU unit. This system was used only for back-up during these tests so no attempt will be made to correct this until completion of the present series of tests.

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~~CONFIDENTIAL~~SECTION 6Acoustica Propellant Loading Control System

Acoustica propellant loading control system performed unsatisfactorily during the fuel loading sequence of Run 423. The Acoustica 90% fuel probe signalled rapid load stop at 1.9 minutes which locked the system out of an automatic rapid fill sequence. A manual loading sequence was initiated at this time and fuel and LO2 tanking were continued. After exceeding the level of the 90% probe the automatic fill sequence was again initiated and performed satisfactorily for the remainder of the run. Post test examination of this probe showed the crossover impedance to be out of tolerance. It is felt that an excessively high temperature in the top of the fuel tank may have some effect on the crystal in the Acoustica probes. Table 3 shows the temperature during Runs 417 through 424. Post test examination revealed the LO2 99.8% probe burned out. The Acoustica 99% probe will be used for fine fill cutoff for the remainder of the Acoustica controlled runs.

The Acoustica propellant loading control system performed satisfactorily on Run 424 with good agreement to the levels indicated by the other propellant sensing systems.

On Run 425 the Acoustica system performed unsatisfactorily during the LO2 loading sequence. The Acoustica 90% probe prematurely signalled LO2 load stop when the level was 68%. LO2 tanking was continued using the manual loading procedure. Post test examination of the 90% LO2 probe and control unit showed the sensitivity to have drifted from its original setting. The current at the datafax control unit had to be increased to produce a LO2 sensitive sensor.

The Acoustica propellant loading control system performed satisfactorily on Run 426. The Acoustica system is compared to the other sensing systems in Tables 4 through 7 for these tests.

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SECTION 7

Missile Pressurization System

The missile tank pressurization system performance was satisfactory during Runs 423, 424, 425 and 426. Sequence III pressurization was not initiated during these runs. However, tank pressures were maintained within the prescribed limits in all other sequences.

Operation of the LO2 boiloff valve P/N 27-80588-811 was satisfactory during Run 423. During Runs 424, 425 and 426 the LO2 boiloff valve closed light on the panel failed to cycle when visual observation indicated that the valve cycled. It is felt that either the valve is not completely closing or the closed microswitch is intermittently failing under conditions of high-venting such as is experienced during initial chilldown. This problem is under investigation.

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SECTION 8

Ground Support Equipment

The performance of the ground support equipment during Runs 423, 424, 425 and 426 was satisfactory.

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SECTION 9

Data

In the following tabulation of time slice data an instrumentation deviation or malfunction is noted by a number/letter combination in place of a data value. For explanation see Instrumentation Malfunction Code, page 34.

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1-95 423 DATE 08-04-59

MEAS #	DESCRIPTION	UNIT REC	0	3	5	8	11	13
F1001P	LO2 TANK HELIUM	PSIG L/N	1.8	3.6	3.0	3.0	2.9	3.0
F1003P	FUEL TANK HELIUM	PSIG L/N	10.1	28.8	27.2	58.1	58.3	58.4
F1066P	GO2 BO LN @ ELBOW	PSIG L/N	2.3	2.1	2.3	2.6	2.6	2.8
F1246P	B TK HE BTLS H1	PSIG BRN	130	100	1250	2200	2780	3070
F1248P	S TK HE BTLS H1	PSIG BRN	280	280	1250	2155	2770	3030
F1291P	S CTL BTL H1	PSIG BRN	290	290	1220	2180	2740	3060
F1770P	LN2 STK ULL	PSIG L/N	0	89	89	89	88	88
F1952P	LO2 STOR TK PR	PSIG BRN	0	19	19	106	106	106
F1953P	FUEL STORAGE TK PR	PSIG BRN		111	113	117	117	118
F1105R	LN2 FLOW	GPM L/N	0	84	86	85	85	87
F1004T	FUEL TANK HE	DGF BRN	99	133	88	88	87	88
F1064T	GO2 BO @ ELBOW	DGF BRN	92	104	-227	-203	-210	-267
F1247T	B TK HE BTL	DGF BRN	83	34	-136	-262	-288	-295
F1290T	SUS CTL HE BTLS	DGF BRN	99	96	90	51	28	22
F1297T	B TK HE BTLS	DGF BRN	82	19	-156	-279	-298	-304
F1739T	FUEL PRESS GAS	DGF BRN	90	72	54	58	60	34
F1744T	HE-LN2 HT EXCH OUT	DGF BRN	27	29	-300	-310	-310	-310
F1805T	PRESS GAS MAN	DGF BRN	81	79	79	66	55	55
F1894T	HE LINE AT STUB UP	DGF BRN	2E	2E	2E	2E	2E	2E
F1910T	IN LINE EXT OUT	DGF L/N	40	-5	-243	-260	-262	-263
N1980T	TEMP TO SAMPLE BTL	DGF BRN	69	61	60	56	53	49
N1983T	FULL FUEL PRESS BTL	DGF BRN	94	95	94	92	90	90
P1001P	B1 LO2 PUMP IN	PSIG L/N	0	3.8	4.7	18.7	26.4	26.3
P1672P	VERN FUL TK DIF	PID BRN	0.49	1.76	0.84	1.20	1.12	1.03
P1622P	PRESS DIF ON LO2 TK	PID BRN	0.02	0.02	0.03	0.02	0.68	2.11
P1814P	LO2 TPG VLV	PID BRN	1.02	7.1	15.2	1.02	78	78
P1816P	LO2 SUBCOOLER	PID BRN	-0.4	10	4	0.20	0.50	-0.80
	ENG LO2 TK PR	PID BRN	0.15	4.4	5.0	16.0	20	20.5
P1900P	LAUNCHER INLET LO2	PSIG BRN	3	21	15	66	39	11
P1908P	PR DIF FUEL TK	PID BRN	-0.01	0	0.67	1.18	1.18	1.18
P1950P	LAUNCHER INLET FUEL	PSIG L/N	8	79	40	35	37	39
P1245R	T SYS FUEL FR	GPM L/N	0	4060	380	0	0	0
P1020T	B1 LO2 P IN	DGF BRN	78	78	-293	-292	-289	-285
P1054T	B2 LO2 P IN	DGF BRN	78	-291	-292	-296	-284	-279
P1530T	SUS LO2 P IN	DGF BRN	78	-292	-292	-280	-276	-275
P1700T	FUL STK DISCH	DGF BRN	90	90	88	88	90	88
P1862T	LO2 SUBCOOLER OUT	DGF BRN	43	-22	-43	-41	-6	4
P1869T	LO2 TFG DISCH	DGF BRN	79	79	27	33	40	42
P1887T	ENG COMP AMB BYCONE	DGF BRN	85	76	65	54	46	43
P1888T	VERN CTL MAN ENV	DGF BRN	91	90	87	82	77	73
P1889T	VERN CTL MAN METAL	DGF BRN	90	88	87	82	77	73
P1903T	LAUNCHER LO2 IN	DGF BRN	78	-198	-244	-265	-279	-266
P1904T	B2 LO2 PMP VOL EXT	DGF BRN	90	89	77	67	54	46

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1-95 423 DATE 08-04-59

MEAS #	DESCRIPTION	UNIT REC	TIME	IN	MIN				
			0	3	5	8	11	13	
P1905T	B1 LO2 PMP VOL INT	DGF BRN	78	-287	-287	-276	78	78	
P1906T	B2 LO2 PMP VOL INT	DGF BRN	78	78	78	78	78	78	
P1907T	B1 LO2 PMP VOL EXT	DGF BRN	77	77	70	54	43	35	
P1912T	LAUNCHER LO2 OUT	DGF BRN	30	30	-300	-313	-317	-319	
P1925T	LO2 RECIRC IN	DGF BRN	78	-295	-293	-298	-292	-287	
U1901P	LO2 TK HEAD	%FUL BRN	0	0.90	6.2	32	95	100	
U1902P	FUL TK HEAD	%FUL BRN	0	39	46	100	100	100	
U1091V	ERROR RAT DMOD OTP	VDC BRN					0	4	

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1-95 424 TIME SLICE DATA

MEAS #	DESCRIPTION	UNIT	REC	TIME	IN	MIN			
				3	5	8	11	13	
F1001P	LO2 TANK HELIUM	PSIG	L/N	2.2	3.6	2.5	2.4	2.1	2.4
F1003P	FUEL TANK HELIUM	PSIG	L/N	10.2	28	27.1	56	58.2	58.2
F1066P	G02 BO LN @ ELBOW	PSIG	L/N	2.2	2.2	2.2	2.3	2.4	2.7
F1246P	B TK HE BTLS H1	PSIG	BRN	330	260	150	90	90	90
F1248P	S TK HE BTLS H1	PSIG	BRN	450	430	430	420	410	410
F1291P	S CTL BTL H1	PSIG	BRN	470	470	460	460	450	450
F1770P	LN2 STK ULL	PSIG	L/N	0	90	90	89	88	88
F1952P	LO2 STOR TK PR	PSIG	BRN	0	21	21	106	107	107
F1953P	FUEL STORAGE TK PR	PSIG	BRN	9	111	115	117	118	118
F1105R	LN2 FLOW	GPM	L/N	0	86	84	86	86	84
F1004T	FUEL TANK HE	DGF	BRN	116	138	88	88	88	88
F1064T	G02 BO @ ELBOW	DGF	BRN	99	-30	-227	-204	-204	-228
F1247T	B TK HE BTL	DGF	BRN	84	25	-139	-304	316	317
F1290T	SUS CTL HE BTLS	DGF	BRN	78	39	95	89	83	78
F1297T	B TK HE BTLS	DGF	BRN	91	16	-184	-317	-319	-320
F1739T	FUEL PRESS GAS	DGF	BRN	94	62	43	49	51	53
F1744T	HE-LN2 HT EXCH OUT	DGF	BRN	-22	-19	-31	0	10	16
F1805T	PRESS GAS MAN	DGF	BRN	81	79	77	66	55	55
F1894T	HE LINE AT STUB UP	DGF	BRN	78	78	78	78	78	78
F1910T	IN LINE EXT OUT	DGF	L/N	-15	-85	-160	-117	-105	-102
N1980T	TEMP TO SAMPLE BTL	DGF	BRN	14	74	71	64	58	59
N1983T	FULL FUEL PRESS BTL	DGF	BRN	93	94	90	90	88	88
P1001P	B1 LO2 PUMP IN	PSIG	BRN	1.3	5.3	6.3	20.8	28	28
P1672P	VERN FUL TK DIF	PID	BRN	7F					
P1682P	PRESS DIF ON LO2 TK	PID	BRN	-0.01	0	0	0	.76	1.5
P1814P	LO2 TPG VLV	PID	BRN	-3.4	.5	5.2	10.5	19.7	19.4
P1816P	LO2 SUBCOOLER	PID	BRN	-0.3	3	5	78		
P1900P	LAUNCHER INLET LO2	PSIG	BRN	2	23	15	65	38	7
P1908P	PR DIF FUEL TK	PID	BRN	.01	0	.65	1.17	1.17	1.17
P1930P	ENG LO2 TK PRESS	PID	BRN	1.4	3.9	4.1	10.7	13.3	13.3
P1950P	LAUNCHER INLET FUEL	PSIG	L/N	8.9	80	40	31	30	36
P1245R	T SYS FUEL FR	GPM	L/N	0	4230	380			
P1020T	B1 LO2 P IN	DGF	BRN	78	-292	-293	-293	-290	-299
P1054T	B2 LO2 P IN	DGF	BRN	70	-290	292	-296	-284	-311
P1530T	SUS LO2 P IN	DGF	BRN	78	-292	-291	-281	-277	-277
P1700T	FUL STK DISCH	DGF	BRN	38	90	88	88	88	88
P1862T	LO2 SUBCOOLER OUT	DGF	BRN	-16	-211	-268	-284	-293	-293
P1869T	LO2 TPG DISCH	DGF	BRN	79	-81	-241	-264	-270	-270
P1887T	ENG COMP AMB BYCONE	DGF	BRN	88	78	66	55	50	48
P1888T	VERN CTL MAN ENV	DGF	BRN	95	94	92	88	85	82
P1889T	VERN CTL MAN METAL	DGF	BRN	94	94	92	88	58	82
P1903T	LAUNCHER LO2 IN	DGF	BRN	78	-215	-256	-269	-275	-268
P1904T	B2 LO2 PUMP VOL EXT	DGF	BRN	92	90	76	65	55	50

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P1905T	B1 LO2 PUMP VOL INT	DGF BRN	7B	-287	-286	-276	7B	7B
P1906T	B2 LO2 PUMP VOL INT	DGF BRN	7B	7B	7B	7B	7B	7B
P1907T	B1 LO2 PUMP VOL EXT	DGF BRN	-17	-33	-31	4	8	10
P1912T	LAUNCHER LO2 OUT	DGF BRN	85	85	72	57	45	40
P1925T	LO2 RECIRC IN	DGF BRN	7B	-294	-293	-298	-295	-293
U1901P	LO2 TK HEAD	%FUL BRN	0	2	9	31	96	100
U1902P	FUL TK HEAD	%FUL BRN	0	46	92	100	100	100
U1091V	ERROR RAT DMOD OTP	VDC BRN					0	3.2

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1-95 425 DATE 08-06-59

MEAS #	DESCRIPTION	UNIT REC	0	TIME 3	IN 5	MIN 8	11	13
F1001P	LO2 TANK HELIUM	PSIG L/N	2.3	3.0	2.8	2.8	2.6	2.8
F1003P	FUEL TANK HELIUM	PSIG L/N	9.5	27.8	26.0	56.2	56.5	56.5
F1066P	GO2 BO LN @ ELBOW	PSIG L/N	2.1	1.8	2.2	2.4	2.3	2.8
F1246P	B TK HE BTLS H1	PSIG BRN	*					
F1248P	S TK HE BTLS H1	PSIG BRN	*					
F1291P	S CTL BTL H1	PSIG BRN	*					
F1770P	LN2 STK ULL	PSIG L/N	*					
F1952P	LO2 STOR TK PR	PSIG BRN	0	20	20	107	107	108
F1953P	FUEL STORAGE TK PR	PSIG BRN	6	107	111	113	114	114
F1105R	LN2 FLOW	GPM L/N	*					
F1004T	FUEL TANK HE	DGF BRN	120	132	90	88	88	88
F1064T	GO2 BO @ ELBOW	DGF BRN	104	112	-229	-203	-189	-197
F1247T	B TK HE BTL	DGF BRN	*					
F1249T	S TK HE BTL	DGF BRN	*					
F1290T	SUS CTL HE BTLS	DGF BRN	*					
F1297T	B TK HE BTLS	DGF BRN	*					
F1739T	FUEL PRESS GAS	DGF BRN	95	74	58	61	65	65
F1744T	HE-LN2 HT EXCH OUT	DGF BRN	86	86	86	86	86	86
F1805T	PRESS GAS MAN	DGF BRN	85	85	85	73	62	62
F1894T	HE LINE AT STUB UP	DGF BRN	*					
F1910T	IN LINE EXT OUT	DGF L/N	*					
N1980T	TEMP TO SAMPLE BTL	DGF BRN	74	4	72	67	64	64
N1983T	FULL FUEL PRESS BTL	DGF BRN	95	96	95	94	92	93
P1001P	B1 LO2 PUMP IN	PSIG L/N	2.0	7.0	6.8	21.6	29.0	30.1
	LO2 TK VENT	PID BRN	0	0.59	0	8.45	11.6	11.7
P1682P	PRESS DIF ON LO2 TK	PID BRN	0.01	0.01	0.02	0.02	0.02	1.48
P1814P	LO2 TPG VLV	PID BRN	-7.1	1.5	5.6	10.1	19.5	19.1
P1816P	LO2 SUBCOOLER	PID BRN	2.3	2.3	4.3	20.3	20.2	20.3
P1900P	LAUNCHER INLET LO2	PSIG BRN	3	19	14	64	36	8
P1908P	PR DIF FUEL TK	PID BRN	0.3	0	0.6	1.2	1.2	1.2
P1930P	ENG LO2 TK PR	PID BRN	2.9	7.7	7.7	19.6	24.1	24
P1950P	LAUNCHER INLET FUEL	PSIG L/N	10	81	41	33	36	38
P1245R	T SYS FUEL FR	GPM L/N	0	3870	400	0	0	0
P1020T	B1 LO2 P IN	DGF BRN	78	-292	-293	-293	-292	-288
P1054T	B2 LO2 P IN	DGF BRN	78	-289	-293	-297	-288	-307
P1530T	SUS LO2 P IN	DGF BRN	78	-292	-292	-281	-278	-277
P1700T	FUL STK DISCH	DGF BRN	95	90	90	90	90	90
P1862T	LO2 SUBCOOLER OUT	DGF BRN	-88	-216	-263	-281	-286	-285
P1869T	LO2 TPG DISCH	DGF BRN	73	-58	-239	-266	-276	-276
P1887T	ENG COMP AMB BYCONE	DGF BRN	93	97	93	90	89	89
P1888T	VERN CTL MAN ENV	DGF BRN	100	103	103	103	100	100
P1889T	VERN CTL MAN METAL	DGF BRN	100	100	100	100	100	100
P1903T	LAUNCHER LO2 IN	DGF BRN	78	-215	-247	-269	-273	-274

* LN2/HE NOT LOADED THIS RUN.

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MEAS #	DESCRIPTION	UNIT REC	0	TIME 3	IN 5	MIN 8	11	13
P1905T	B1 LO2 PUMP VOL INT	DGF BRN	78	78	78	78	78	78
P1906T	B2 LO2 PUMP VOL INT	DGF BRN	78	-287	-287	-276	78	78
P1912T	LAUNCHER LO2 OUT	DGF BRN	98	-185	-231	-248	-257	-233
P1925T	LO2 RECIRC IN	DGF BRN	-267	-295	-295	-298	-296	-291
U1901P	LO2 TK HEAD	%FUL BRN	0	2	7	30	90	100
U1902P	FUL TK HEAD	%FUL BRN	0	45	92	100	100	100
U1091V	ERROR RAT DMOD OTP	VDC BRN						2.5

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1-95 426 DATE 08-06-59

MEAS #	DESCRIPTION	UNIT REC	0	TIME 3	IN 5	MIN 8	11	15
F1001P	LO2 TANK HELIUM	PSIG L/N	2.4	4.0	2.4	2.8	2.5	2.8
F1003P	FUEL TANK HELIUM	PSIG L/N	8.9	26.8	25.3	55	55.2	55.3
F1066P	G02 BO LN @ ELBOW	PSIG L/N	2.2	2.1	2.3	2.4	2.4	2.5
F1246P	B TK HE BTLS H1	PSIG BRN	*					
F1248P	S TK HE BTLS H1	PSIG BRN	*					
F1291P	S CTL BTL H1	PSIG BRN	*					
F1770P	LN2 STK ULL	PSIG L/N	*					
F1952P	LO2 STOR TK PR	PSIG BRN	0	20	20	106	106	107
F1953P	FUEL STORAGE TK PR	PSIG BRN	7	111	115	117	117	118
F1105R	LN2 FLOW	GPM L/N	*					
F1004T	FUEL TANK HE	DGF BRN	**	140	88	88	87	87
F1064T	G02 BO @ ELBOW	DGF BRN	**	1	-209	-179	-200	-259
F1247T	B TK HE BTL	DGF BRN	*					
F1249T	S TK HE BTL	DGF BRN	*					
F1290T	SUS CTL HE BTLS	DGF BRN	*					
F1297T	B TK HE BTLS	DGF BRN	*					
F1739T	FUEL PRESS GAS	DGF BRN	**	66	58	60	63	66
F1744T	HE-LN2 HT EXCH OUT	DGF BRN	**	88	88	88	88	88
F1805T	PRESS GAS MAN	DGF BRN	**	82	82	64	56	61
F1894T	HE LINE AT STUB UP	DGF BRN	*					
F1910T	IN LINE EXT OUT	DGF L/N	*					
N1980T	TEMP TO SAMPLE BTL	DGF BRN	69	76	76	73	69	65
N1983T	FULL FUEL PRESS BTL	DGF BRN	**	94	94	93	92	90
P1001P	B1 LO2 PUMP IN	PSIG L/N	2.0	7.0	7.0	22.2	28.3	31.3
P1682P	PRESS DIF ON LO2 TK	PID BRN	0	0	0	0.3	1.1	1.5
P1814P	LO2 TPG VLV	PID BRN	-7.0	2.1	23.6	95.0	78	29.8
P1816P	LO2 SUBCOOLER	PID BRN	**	0	-0.8	2.2	0.6	19.6
	ENG LO2 TK VENT	PID BRN	0	0	0	9.3	12.6	10.2
P1900P	LAUNCHER INLET LO2	PSIG BRN	2A	2A	2A	2A	2A	2A
P1908P	PR DIF FUEL TK	PID BRN	0	0	0.8	1.1	1.2	1.2
P1930P	ENG LO2 TK PRESS	PID BRN	5.2	7.8	7.9	21.9	24.7	23.4
P1950P	LAUNCHER INLET FUEL	PSIG L/N	9	81	41	35	38	41
P1245R	T SYS FUEL FR	GPM L/N	0	3830	390	0	0	0
P1020T	B1 LO2 P IN	DGF BRN	7B	-292	-292	-289	-286	-275
P1054T	B2 LO2 P IN	DGF BRN	7B	-291	-293	-297	-285	-261
P1530T	SUS LO2 P IN	DGF BRN	7B	-287	-291	-280	-277	-278
P1700T	FUL STK DISCH	DGF BRN	**	92	89	89	89	88
P1862T	LO2 SUBCOOLER OUT	DGF BRN	**	-26	-19	-41	-37	-209
P1869T	LO2 TPG DISCH	DGF BRN	**	30	35	26	28	-160
P1887T	ENG COMP AMB BYCONE	DGF BRN	127	125	120	114	108	103
P1888T	VERN CTL MAN ENV	DGF BRN	*	136	134	132	131	129
P1889T	VERN CTL MAN METAL	DGF BRN	*	136	134	132	131	129
P1903T	LAUNCHER LO2 IN	DGF BRN	-100	-206	-248	-274	-276	-277

* LN2/HE NOT LOADED THIS RUN.

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MEAS #	DESCRIPTION	UNIT REC	TIME IN MIN						
			0	3	5	8	11	15	
P1904T	B2 LO2 PUMP VOL EXT	DGF BRN	7F						
P1905T	B1 LO2 PUMP VOL INT	DGF BRN	7B	7B	7B	7B	7B	7B	
P1906T	B2 LO2 PUMP VOL INT	DGF BRN	7B	-286	-287	-276	7B	7B	
P1907T	B1 LO2 PUMP VOL EXT	DGF BRN	7F						
P1912T	LAUNCHER LO2 OUT	DGF BRN	**	-194	-232	-252	-252	-222	
P1925T	LO2 RECIRC IN	DGF BRN	7B	-295	-294	-299	-294	-281	
U1901P	LO2 TK HEAD	%FUL BRN	0	4	8	39	100	100	
U1902P	FUL TK HEAD	%FUL BRN	6	54	95	100	100	100	
U1091V	ERROR RAT DMOD OTP	VDC BRN					1.2	2.6	

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TIME	PEN #	MEAS #	DESCRIPTION	ACT	DEACT
0.00	2	N1901X	F PREPRES 1 VLV CLSD		X
0.00	8	N1912X	FUEL LOAD START SW	X	
0.00	47	N1925X	LO2 COOLDOWN ST SW	X	
0.00	48	N1926X	LO2 TK VENT VLV CLSD		X
0.00	58	N1962X	LN2 VENT VLV OPEN	X	
0.01	13	N1917X	F GRD F/D VLV CLSD		X
0.01	72	N1895X	LN2 STK VENT VLV NCL		X
0.02	69	N1892X	LN2 LOAD VLV CLSD		X
0.03	9	N1913X	F PREPRESS VLV 1 OPN		X
0.03	14	N1918X	F GND F/D VLV OPEN		X
0.03	70	N1893X	LN2 LOAD VLV OPN		X
0.03	71	N1894X	LN2 STK P VLV CLSD		X
0.38	8	N1912X	FUEL LOAD START SW		X
0.39	3	N1902X	F FINE LOAD VLV CLSD		X
0.39	9	N1913X	F PREPRESS VLV 1 OPN	X	
0.39	11	P1966X	F MSL F/D VLV CLSD		X
0.40	2	N1901X	F PREPRES 1 VLV CLSD	X	
0.41	10	N1914X	F FINE LOAD VLV OPEN		X
0.43	12	P1967X	F MSL F/D VLV OPEN		X
0.45	26	N1890X	INTER FUL STK PRESS	X	
0.91	17	N1922X	FUL RAPID LD SIGNAL		X
1.63	71	N1894X	LN2 STK P VLV CLSD	X	
1.90	27	N1969X	AA FUEL 90% PROBE	X	
2.13	18	N1923X	FUL RAPID VLV CLSD		X
2.17	15	N1919X	F STK PRESS CLSD		X
2.18	4	N1903X	FUL RAPID LD VLV OPN		X
2.39	43	N1906X	LO2 FINE LD VLV CLSD		X
2.39	50	N1930X	LO2 GND F/D VLV OPEN		X
2.39	64	N1968X	LO2 MSL F/D VLV CLSD		X
2.40	49	N1929X	LO2 GND F/D VLV CLSD		X
2.41	44	N1907X	LO2 STK P VLV A CLSD		X
2.42	51	N1931X	LO2 FINE LD VLV OPEN		X
2.42	63	N1967X	LO2 MSL F/D VLV CLN		X
2.43	54	N1934X	L RAPID LD VLV CLSD		X
2.47	42	N1905X	L RAPID LD VLV OPEN		X
2.55	66	N1891X	LO2 NOT IN UPPER LN		X
2.60	56	N1949X	LO2 LN LIQ DET/INTRM		X
2.70	44	N1907X	LO2 STK P VLV A CLSD	X	
2.83	56	N1949X	LO2 LN LIQ DET/INTRM	X	
3.03	68	F1897X	FLIGHT HE 1 VLV CLSD		X
3.05	68	F1897X	FLIGHT HE 1 VLV CLSD	X	
3.52	56	N1949X	LO2 LN LIQ DET/INTRM		X
4.02	56	N1949X	LO2 LN LIQ DET/INTRM	X	
4.51	4	N1903X	FUL RAPID LD VLV OPN	X	

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TIME	PEN #	MEAS #	DESCRIPTION	ACT	DEACT
4.58	18	N1923X	FUL RAPID VLV CLSD	X	
4.72	56	N1949X	LO2 LN LIG DET/INTRM		X
4.73	79	P1899X	AA PROBE @ STA 910	X	
5.04	15	N1915X	F STK PRESS CLSD	X	
5.06	78	P1898X	HW PROBE @ STA 910	X	
6.61	6	P1999X	MSL FUELED 100%		X
6.62	3	N1902X	F FINE LOAD VLV CLSD	X	
6.62	10	N1914X	F FINE LOAD VLV OPEN	X	
6.62	29	N1971X	AA FUEL 100% PROBE	X	
6.63	12	P1967X	F MSL F/D VLV OPEN	X	
6.66	11	P1966X	F MSL F/D VLV CLSD	X	
6.68	14	N1918X	F GND F/D VLV OPEN	X	
6.70	13	N1917X	F GRD F/D VLV CLSD	X	
6.74	6	P1999X	MSL FUELED 100%	X	
6.75	29	N1971X	AA FUEL 100% PROBE		X
6.94	44	N1907X	LO2 STK P VLV A CLSD		X
6.95	55	N1936X	LO2 LOADING PRESS	X	
7.10	63	N1967X	LO2 MSL F/D VLV OPEN	X	
7.24	76	P1896X	HW PROBE @ STA 888	X	
7.26	79	P1899X	AA PROBE @ STA 910		X
7.51	75	P1895X	AA PROBE @ STA 866	X	
7.51	79	P1899X	AA PROBE @ STA 910	X	
8.19	77	P1897X	AA PROBE @ STA 888	X	
8.93	37	P1890X	HW PROBE @ STA 700	X	
9.08	40	P1893X	AA PROBE @ STA 793	X	
9.09	79	P1899X	AA PROBE @ STA 910		X
9.19	77	P1897X	AA PROBE @ STA 888		X
9.19	79	P1899X	AA PROBE @ STA 910	X	
9.36	77	P1897X	AA PROBE @ STA 888	X	
9.43	38	P1891X	AA PROBE @ STA 700	X	
9.80	31	N1973X	HW LO2 RAPID SIG 90%	X	
9.83	42	N1905X	L RAPID LD VLV OPEN	X	
9.89	54	N1934X	L RAPID LD VLV CLSD	X	
11.16	73	P1673X	LO2 ST TK FULL	X	
11.85	33	N1975X	HW LO2 FIN SIG 99%	X	
11.85	46	P1998X	MSL LO2 @ 100%		X
11.95	51	N1931X	LO2 FINE LD VLV OPEN	X	
11.83	43	N1906X	LO2 FINE LD VLV CLSD	X	
11.89	49	N1929X	LO2 GND F/D VLV CLSD	X	
11.90	50	N1930X	LO2 GND F/D VLV OPEN	X	
11.98	66	N1891X	LO2 NOT IN UPPER LN	X	
15.05	46	P1998X	MSL LO2 @ 100%	X	
15.14	46	P1998X	MSL LO2 @ 100%		X
15.56	43	N1906X	LO2 FINE LD VLV CLSD		X

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TIME	PEN #	MEAS #	DESCRIPTION	ACT	DEACT
15.58	51	N1931X	LO2 FINE LD VLV OPEN		X
15.74	47	N1925X	LO2 COOLDOWN ST SW		X
15.74	48	N1926X	LO2 TK VENT VLV CLSD	X	
15.75	51	N1931X	LO2 FINE LD VLV OPEN	X	
15.78	43	N1906X	LO2 FINE LD VLV CLSD	X	

NOTE

1. THESE PENS ACTIVATED THROUGHOUT THE TEST

7	N1911X	EMER MSL PRESS COND
16	N1921X	FUEL LOADING PRESS
22	N1956X	FUEL STK VT VLV CLSD
23	N1960X	F MAIN DRN VLV CLSD
24	N1961X	F MAIN DRN VLV OPEN
45	P1988X	MSL LO2 @ 95%
52	N1932X	LO2 TOPPING VLV CLSD
53	N1933X	LO2 TOPPING VLV OPEN
57	N1951X	PRESS DUCT FUEL SNSR
59	N1963X	L MAIN DRN VLV CLSD
60	N1964X	L MAIN DRN VLV OPEN

2. THESE PENS DEACTIVATED THROUGHOUT THE TEST

5	P1997X	MSL FUELED 95%
19	N1943X	F LN LIQ DET/INTERM
20	N1955X	FUEL DRAIN START SW
25	N1965X	FUL DRAIN COMPLETE
28	N1970X	AA FUEL 95% PROBE
30	N1972X	AA FUEL 99.89% PROBE
32	N1974X	HW LO2 BU 95% SIG
34		
35	N1977X	HW LO2 TOPG COF SIG
36	N1978X	HW LO2 EM SIG 100.2%
39	P1892X	HW PROBE @ STA 793
62	N1966X	LO2 DRAIN COMPLETE
65	N1889X	INTER LO2 STK PRESS
67	F1896X	LN2 INFLIGHT HE LOAD
74	P1894X	LO2 95% EMERG COF

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TIME	PEN #	MEAS #	DESCRIPTION	ACT	DEACT
0.00	8	N1912X	FUEL LOAD START SW	X	
0.00	2	N1901X	F PREPRES 1 VLV CLSD		X
0.00	47	N1925X	LO2 COOLDOWN ST SW	X	
0.00	58	N1962X	LN2 VENT VLV OPEN		X
0.01	48	N1926X	LO2 TK VENT VLV CLSD		X
0.01	72	N1895X	LN2 STK VENT VLV NCL		X
0.02	69	N1892X	LN2 LOAD VLV CLSD		X
0.03	9	N1913X	F PREPRESS VLV 1 OPN		X
0.03	70	N1893X	LN2 LOAD VLV OPN		X
0.03	71	N1894X	LN2 STK P VLV CLSD		X
0.43	3	N1902X	F FINE LOAD VLV CLSD		X
0.43	8	N1912X	FUEL LOAD START SW		X
0.43	9	N1913X	F PREPRESS VLV 1 OPN	X	
0.43	11	P1966X	F MSL F/D VLV CLSD		X
0.44	2	N1901X	F PREPRES 1 VLV CLSD	X	
0.44	13	N1917X	F GRD F/D VLV CLSD		X
0.45	10	N1914X	F FINE LOAD VLV OPEN		X
0.46	14	N1918X	F GND F/D VLV OPEN		X
0.47	12	P1967X	F MSL F/D VLV OPEN		X
0.47	26	N1890X	INTER FUL STK PRESS	X	
0.74	19	N1943X	F LN LIQ DET/INTERM		X
0.92	17	N1922X	FUL RAPID LD SIGNAL		X
1.47	71	N1894X	LN2 STK P VLV CLSD	X	
1.91	18	N1923X	FUL RAPID VLV CLSD		X
1.96	4	N1903X	FUL RAPID LD VLV OPN		X
2.09	15	N1919X	F STK PRESS CLSD		X
2.21	16	N1921X	FUEL LOADING PRESS	X	
2.22	43	N1906X	LO2 FINE LD VLV CLSD		X
2.22	52	N1932X	LO2 TOPPING VLV CLSD		X
2.23	50	N1930X	LO2 GND F/D VLV OPEN		X
2.24	49	N1929X	LO2 GND F/D VLV CLSD		X
2.24	53	N1933X	LO2 TOPPING VLV OPEN		X
2.24	64	N1968X	LO2 MSL F/D VLV CLSD		X
2.25	44	N1907X	LO2 STK P VLV A CLSD		X
2.26	51	N1931X	LO2 FINE LD VLV OPEN		X
2.26	63	N1967X	LO2 MSL F/D VLV OPEN		X
2.27	54	N1934X	L RAPID LD VLV CLSD		X
2.32	42	N1905X	L RAPID LD VLV OPEN		X
2.32	44	N1907X	LO2 STK P VLV A CLSD	X	
2.37	66	N1891X	LO2 NOT IN UPPER LN		X
2.38	66	N1891X	LO2 NOT IN UPPER LN	X	
2.40	56	N1949X	LO2 LN LIQ DET/INTRM		X
2.41	56	N1949X	LO2 LN LIQ DET/INTRM	X	
2.42	56	N1949X	LO2 LN LIQ DET/INTRM		X

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TIME	PER #	MEAS #	DESCRIPTION	ACT	DEACT
2.75	56	N1949X	LO2 LA LIG DET/INTRM	X	
4.24	27	N1969X	AA FUEL 90% PROBE	X	
4.25	4	N1903X	FUL RAPID LD VLV OPN	X	
4.33	18	N1923X	FUL RAPID VLV CLSD	X	
4.54	79	P1899X	AA PROBE @ STA 910	X	
4.55	78	P1898X	HW PROBE @ STA 910	X	
6.77	6	P1999X	MSL FUELED 100%		X
6.78	3	N1902X	F FINE LOAD VLV CLSD	X	
6.78	5	P1997X	MSL FUELED 95%	X	
6.78	10	N1914X	F FINE LOAD VLV OPEN	X	
6.78	29	N1970X	AA FUEL 95% PROBE	X	
6.79	12	P1967X	F MSL F/D VLV OPEN	X	
6.83	11	P1966X	F MSL F/D VLV CLSD	X	
6.84	14	N1918X	F GND F/D VLV OPEN	X	
6.84	76	P1896X	HW PROBE @ STA 888	X	
6.85	79	P1899X	AA PROBE @ STA 910		X
6.87	13	N1917X	F GRD F/D VLV CLSD	X	
6.91	6	P1999X	MSL FUELED 100%	X	
6.91	29	N1970X	AA FUEL 95% PROBE		X
7.08	55	N1936X	LO2 LOADING PRESS		X
7.11	44	N1907X	LO2 STK P VLV A CLSD		X
7.22	65	N1889X	INTER LO2 STK PRESS	X	
7.53	44	N1907X	LO2 STK P VLV A CLSD	X	
7.54	75	P1895X	AA PROBE @ STA 866	X	
7.55	44	N1907X	LO2 STK P VLV A CLSD		X
7.55	79	P1899X	AA PROBE @ STA 910	X	
8.20	77	P1897X	AA PROBE @ STA 888	X	
8.95	27	P1890X	HW PROBE @ STA 700	X	
9.07	40	P1893X	AA PROBE @ STA 793	X	
9.10	79	P1899X	AA PROBE @ STA 910		X
9.17	79	P1899X	AA PROBE @ STA 910	X	
9.18	77	P1897X	AA PROBE @ STA 888		X
9.29	77	P1897X	AA PROBE @ STA 888	X	
9.32	38	P1891X	AA PROBE @ STA 700	X	
9.82	31	N1973X	HW LO2 RAPID SIG/90%	X	
9.90	42	N1905X	L RAPID LD VLV OPEN	X	
9.91	54	N1934X	L RAPID LD VLV CLSD	X	
11.40	33	N1975X	HW LO2 FIN SIG 99%	X	
11.41	46	P1998X	MSL LO2 @ 100%		X
11.42	51	N1931X	LO2 FINE LD VLV OPEN	X	
11.44	43	N1906X	LO2 FINE LD VLV CLSD	X	
11.44	44	N1907X	LO2 STK P VLV A CLSD	X	
11.45	49	N1929X	LO2 GND F/D VLV CLSD	X	
11.46	50	N1930X	LO2 GND F/D VLV OPEN	X	

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NOTE

1. THESE PENS ACTIVATED THROUGHOUT THE TEST

7	N1911X	EMER MSL PRESS COND
22	N1956X	FUEL STK VT VLV CLSD
23	N1960X	F MAIN DRN VLV CLSD
24	N1961X	F MAIN DRN VLV OPEN
45	P1988X	MSL LO2 @ 95%
57	N1951X	PRESS DUCT FUEL SNSR
59	N1963X	L MAIN DRN VLV CLSD
60	N1964X	L MAIN DRN VLV OPEN
68	F1897X	FLIGHT HE 1 VLV CLSD

2. THESE PENS DEACTIVATED THROUGHOUT THE TEST

20	N1955X	FUEL DRAIN START SW
25	N1965X	FUL DRAIN COMPLETE
28	N1971X	AA FUEL 100% PROBE
30	N1972X	AA FUEL 99.89% PROBE
32	N1974X	HW LO2 BU 95% SIG
35	N1977X	HW LO2 TOPG COF SIG
36	N1978X	HW LO2 EM SIG 100.2%
39	P1892X	HW PROBE @ STA 793
62	N1966X	LO2 DRAIN COMPLETE
67	F1896X	LN2 INFLIGHT HE LOAD
73	P1673X	LO2 ST TK FULL
74	P1894X	LO2 95% EMERG COF

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TIME	PEN #	MEAS #	DESCRIPTION	ACT	DEACT
0.00	8	N1912X	FUEL LOAD START SW	X	
0.00	2	N1901X	F PREPRES 1 VLV CLSD		X
0.01	47	N1925X	LO2 COOLDOWN ST SW	X	
0.01	48	N1926X	LO2 TK VENT VLV CLSD		X
0.03	9	N1913X	F PREPRESS VLV 1 OPN		X
0.45	3	N1902X	F FINE LOAD VLV CLSD		X
0.45	8	N1912X	FUEL LOAD START SW		X
0.45	9	N1913X	F PREPRESS VLV 1 OPN	X	
0.45	11	P1966X	F MSL F/D VLV CLSD		X
0.46	2	N1901X	F PREPRES 1 VLV CLSD	X	
0.46	13	N1917X	F GRD F/D VLV CLSD		X
0.48	10	N1914X	F FINE LOAD VLV OPEN		X
0.48	14	N1918X	F GND F/D VLV OPEN		X
0.49	12	P1967X	F MSL F/D VLV OPEN		X
0.53	26	N1890X	INTER FUL STK PRESS	X	
0.76	19	N1943X	F LN LIQ DET/INTERM		X
0.94	17	N1922X	FUL RAPID LD SIGNAL		X
1.94	18	N1923X	FUL RAPID VLV CLSD		X
1.99	4	N1903X	FUL RAPID LD VLV OPN		X
2.16	15	N1919X	F STK PRESS CLSD		X
2.23	16	N1921X	FUEL LOADING PRESS	X	
2.25	43	N1906X	LO2 FINE LD VLV CLSD		X
2.25	52	N1932X	LO2 TOPPING VLV CLSD		X
2.26	50	N1930X	LO2 GND F/D VLV OPEN		X
2.26	64	N1968X	LO2 MSL F/D VLV CLSD		X
2.27	44	N1907X	LO2 STK P VLV A CLSD		X
2.27	49	N1929X	LO2 GND F/D VLV CLSD		X
2.27	53	N1933X	LO2 TOPPING VLV OPEN		X
2.28	51	N1931X	LO2 FINE LD VLV OPEN		X
2.29	54	N1934X	L RAPID LD VLV CLSD		X
2.29	63	N1967X	LO2 MSL F/D VLV OPEN		X
2.34	42	N1905X	L RAPID LD VLV OPEN		X
2.35	44	N1907X	LO2 STK P VLV A CLSD	X	
2.40	44	N1907X	LO2 STK P VLV A CLSD		X
2.40	66	N1891X	LO2 NOT IN UPPER LN		X
2.45	56	N1949X	LO2 LN LIQ DET/INTRM		X
2.53	44	N1907X	LO2 STK P VLV A CLSD	X	
2.78	56	N1949X	LO2 LN LIQ DET/INTRM	X	
3.00	36	N1949X	LO2 LN LIQ DET/INTRM		X
4.27	4	N1903X	FUL RAPID LD VLV OPN	X	
4.27	27	N1969X	AA FUEL 90% PROBE	X	
4.34	18	N1923X	FUL RAPID VLV CLSD	X	
4.70	15	N1919X	F STK PRESS CLSD	X	
4.75	78	P1898X	HW PROBE @ STA 910	X	

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TIME	PEN #	MEAS #	DESCRIPTION	ACT	DEACT
4.75	79	P1899X	AA PROBE @ STA 910	X	
6.73	29	N1971X	AA FUEL 100% PROBE	X	
6.74	6	P1999X	MSL FUELED 100%		X
6.75	3	N1902X	F FINE LOAD VLV CLSD	X	
6.75	10	N1914X	F FINE LOAD VLV OPEN	X	
6.76	12	P1967X	F MSL F/D VLV OPEN	X	
6.79	11	P1966X	F MSL F/D VLV CLSD	X	
6.81	14	N1918X	F GND F/D VLV OPEN	X	
6.84	13	N1917X	F GRD F/D VLV CLSD	X	
6.86	29	N1971X	AA FUEL 100% PROBE		X
6.87	6	P1999X	MSL FUELED 100%	X	
7.05	55	N1936X	LO2 LOADING PRESS	X	
7.08	44	N1907X	LO2 STK P VLV A CLSD		X
7.21	76	P1896X	HW PROBE @ STA 888	X	
7.22	65	N1889X	INTER LO2 STK PRESS	X	
7.26	79	P1899X	AA PROBE @ STA 910		X
7.58	75	P1895X	AA PROBE @ STA 866	X	
7.59	79	P1899X	AA PROBE @ STA 910	X	
8.21	77	P1897X	AA PROBE @ STA 888	X	
8.95	37	P1890X	HW PROBE @ STA 700	X	
9.10	40	P1893X	AA PROBE @ STA 793	X	
9.11	31	N1973X	HW LO2 RAPID SIG/90%	X	
9.14	42	N1905X	L RAPID LD VLV OPEN	X	
9.17	31	N1973X	HW LO2 RAPID SIG/90%		X
9.20	54	N1934X	L RAPID LD VLV CLSD	X	
9.35	38	P1891X	AA PROBE @ STA 700	X	
9.43	54	N1934X	L RAPID LD VLV CLSD		X
9.50	42	N1905X	L RAPID LD VLV OPEN		X
10.03	42	N1905X	L RAPID LD VLV OPEN	X	
10.08	31	N1973X	HW LO2 RAPID SIG/90%	X	
10.08	54	N1934X	L RAPID LD VLV CLSD	X	
12.12	33	N1975X	HW LO2 FIN SIG 99%	X	
12.12	46	P1998X	MSL LO2 @ 100%		
12.12	51	N1931X	LO2 FINE LD VLV OPEN	X	
12.15	43	N1906X	LO2 FINE LD VLV CLSD	X	
12.16	49	N1929X	LO2 GND F/D VLV CLSD	X	
12.16	50	N1930X	LO2 GND F/D VLV OPEN	X	
12.30	44	N1907X	LO2 STK P VLV A CLSD		X
16.66	73	P1673X	LO2 ST TK FULL	X	

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NOTE

1. THESE PENS ACTIVATED THROUGHOUT THE TEST

7	N1911X	EMER MSL PRESS COND
22	N1956X	FUEL STK VT VLV CLSD
23	N1960X	F MAIN DRN VLV CLSD
24	N1961X	F MAIN DRN VLV OPEN
45	P1988X	MSL LO2 @ 95%
57	N1951X	PRESS DUCT FUEL SNSR
58	N1952X	LN2 VENT VLV OPEN
59	N1963X	L MAIN DRN VLV CLSD
60	N1964X	L MAIN DRN VLV OPEN
68	F1897X	FLIGHT HE 1 VLV CLSD
69	N1892X	LN2 LOAD VLV CLSD
70	N1893X	LN2 LOAD VLV OPN
71	N1894X	LN2 STK P VLV CLSD
72	N1895X	LN2 STK VENT VLV NCL

2. THESE PENS DEACTIVATED THROUGHOUT THE TEST

5	P1997X	MSL FUELED 95%
25	N1965X	FUL DRAIN COMPLETE
28	N1970X	AA FUEL 95% PROBE
30	N1972X	AA FUEL 99.89% PROBE
32	N1974X	HW LO2 BU 95% SIG
35	N1977X	HW LO2 TOPG COF SIG
36	N1978X	HW LO2 EM SIG 100.2%
39	P1892X	HW PROBE @ STA 793
62	N1966X	LO2 DRAIN COMPLETE
74	P1894X	LO2 95% EMERG COF

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TIME	PEN #	MEAS #	DESCRIPTION	ACT	DEACT
0.00	8	N1912X	FUEL LOAD START SW	X	
0.00	2	N1901X	F PREPRESS 1 VLV CLSD		X
0.00	9	N1913X	F PREPRESS VLV 1 OPN		X
0.00	47	N1925X	LO2 COOLDOWN ST SW	X	
0.00	48	N1926X	LO2 TK VENT VLV CLSD		X
0.37	3	N1902X	F FINE LOAD VLV CLSD		X
0.37	8	N1912X	FUEL LOAD START SW		X
0.37	9	N1913X	F PREPRESS VLV 1 OPN	X	
0.38	2	N1901X	F PREPRESS 1 VLV CLSD	X	
0.38	11	P1966X	F MSL F/D VLV CLSD		X
0.38	13	N1917X	F GRD F/D VLV CLSD		X
0.39	10	N1914X	F FINE LOAD VLV OPEN		X
0.40	14	N1918X	F GND F/D VLV OPEN		X
0.42	12	P1967X	F MSL F/D VLV OPEN		X
0.72	26	N1890X	INTER FUL STK PRESS	X	
0.59	19	N1943X	F LN LIQ DET/INTERM		X
0.75	17	N1922X	FUL RAPID LD SIGNAL		X
1.60	15	N1919X	F STK PRESS CLSD		X
1.68	4	N1903X	FUL RAPID LD VLV OPN		X
1.78	18	N1923X	FUL RAPID VLV CLSD		X
2.04	43	N1906X	LO2 FINE LD VLV CLSD		X
2.04	50	N1930X	LO2 GND F/D VLV OPEN		X
2.05	49	N1929X	LO2 GND F/D VLV CLSD		X
2.05	64	N1968X	LO2 MSL F/D VLV CLSD		X
2.06	16	N1921X	FUEL LOADING PRESS	X	
2.06	44	N1907X	LO2 STK P VLV A CLSD		X
2.07	51	N1931X	LO2 FINE LD VLV OPEN		X
2.08	54	N1934X	L RAPID LD VLV CLSD		X
2.08	63	N1967X	LO2 MSL F/D VLV OPEN		X
2.12	42	N1905X	L RAPID LD VLV OPEN		X
2.14	44	N1907X	LO2 STK P VLV A CLSD	X	
2.21	56	N1949X	LO2 LN LIQ DET/INTRM		X
2.21	66	N1891X	LO2 NOT IN UPPER LN		X
2.26	56	N1949X	LO2 LN LIQ DET/INTRM	X	
2.77	62	N1966X	LO2 DRAIN COMPLETE		X
3.28	56	N1949X	LO2 LN LIQ DET/INTRM		X
4.04	27	N1969X	AA FUEL 90% PROBE	X	
4.05	4	N1903X	FUL RAPID LD VLV OPN	X	
4.12	18	N1923X	FUL RAPID VLV CLSD	X	
4.34	79	P1899X	AA PROBE @ STA 910	X	
4.37	78	P1898X	HW PROBE @ STA 910	X	
4.61	15	N1919X	F STK PRESS CLSD	X	
6.15	6	P1999X	MSL FUELED 100%		X
6.15	29	N1971X	AA FUEL 100% PROBE	X	

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TIME	PEN #	MEAS #	DESCRIPTION	ACT	DEACT
6.16	3	N1902X	F FINE LOAD VLV CLSD	X	
6.16	10	N1914X	F FINE LOAD VLV OPEN	X	
6.16	12	P1967X	F MSL F/D VLV OPEN	X	
6.20	11	P1966X	F MSL F/D VLV CLSD	X	
6.21	14	N1918X	F GND F/D VLV OPEN	X	
6.24	13	N1917X	F GRD F/D VLV CLSD	X	
6.28	6	P1999X	MSL FUELED 100%	X	
6.28	29	N1971X	AA FUEL 100% PROBE		X
6.42	55	N1936X	LO2 LOADING PRESS	X	
6.42	78	P1898X	HW PROBE @ STA 910		X
6.42	79	P1899X	AA PROBE @ STA 910		X
6.46	44	N1907X	LO2 STK P VLV A CLSD		X
6.59	65	N1889X	INTER LO2 STK PRESS	X	
6.72	78	P1898X	HW PROBE @ STA 910	X	
6.73	79	P1899X	AA PROBE @ STA 910	X	
6.98	76	P1896X	HW PROBE @ STA 888	X	
7.02	79	P1899X	AA PROBE @ STA 910		X
7.23	75	P1895X	AA PROBE @ STA 866	X	
7.23	79	P1899X	AA PROBE @ STA 910	X	
7.87	77	P1897X	AA PROBE @ STA 888	X	
8.58	37	P1890X	HW PROBE @ STA 700	X	
8.78	40	P1893X	AA PROBE @ STA 793	X	
8.78	79	P1899X	AA PROBE @ STA 910		X
8.86	79	P1899X	AA PROBE @ STA 910	X	
8.87	77	P1897X	AA PROBE @ STA 888		X
9.08	77	P1897X	AA PROBE @ STA 888	X	
9.12	38	P1891X	AA PROBE @ STA 700	X	
9.47	31	N1973X	HW LO2 RAPID SIG 90%	X	
9.47	42	N1905X	L RAPID LD VLV OPEN	X	
9.52	54	N1934X	L RAPID LD VLV CLSD	X	
11.13	46	P1998X	MSL LO2 @ 100%		X
11.13	51	N1931X	LO2 FINE LD VLV OPEN	X	
11.16	33	N1975X	HW LO2 FIN SIG 99%	X	
11.16	43	N1906X	LO2 FINE LD VLV CLSD	X	
11.16	49	N1929X	LO2 GND F/D VLV CLSD	X	
11.17	50	N1930X	LO2 GND F/D VLV OPEN	X	
11.27	66	N1891X	LO2 NOT IN UPPER LN	X	
11.84	56	N1949X	LO2 LN LIQ DET/INTRM	X	
12.32	56	N1949X	LO2 LN LIQ DET/INTRM		X
13.19	44	N1907X	LO2 STK P VLV A CLSD	X	
14.24	52	N1932X	LO2 TOPPING VLV CLSD		X
14.25	53	N1933X	LO2 TOPPING VLV OPEN		X
14.77	66	N1891X	LO2 NOT IN UPPER LN		X
19.72	73	P1673X	LO2 ST TK FULL	X	

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TIME	PEN #	MEAS #	DESCRIPTION	ACT	DEACT
20.23	53	N1933X	LO2 TOPPING VLV OPEN	X	
20.25	52	N1932X	LO2 TOPPING VLV CLSD	X	
20.54	47	N1925X	LO2 COOLDOWN ST SW		X

NOTE

1. THESE PENS ACTIVATED THROUGHOUT THE TEST

7	N1911X	EMER MSL PRESS COND
22	N1956X	FUEL STK VT VLV CLSD
23	N1960X	F MAIN DRN VLV CLSD
24	N1961X	F MAIN DRN VLV OPEN
45	P1988X	MSL LO2 @ 95%
57	N1951X	PRESS DUCT FUEL SNSR
58	N1962X	LN2 VENT VLV OPEN
59	N1963X	L MAIN DRN VLV CLSD
60	N1964X	L MAIN DRN VLV OPEN
68	F1897X	FLIGHT HE 1 VLV CLSD
69	N1892X	LN2 LOAD VLV CLSD
70	N1893X	LN2 LOAD VLV OPN
71	N1894X	LN2 STK P VLV CLSD
72	N1895X	LN2 STK VENT VLV NCL

2. THESE PENS DEACTIVATED THROUGHOUT THE TEST

5	P1997X	MSL FUELED 95%
25	N1965X	FUL DRAIN COMPLETE
28	N1970X	AA FUEL 95% PROBE
30	N1972X	AA FUEL 99.89% PROBE
32	N1974X	HW LO2 BU 95% SIG
35	N1977X	HW LO2 TOPG COF SIG
36	N1978X	HW LO2 EM SIG 100.2%
39	P1892X	AA PROBE @ STA 793
74	P1894X	LC2 95% EMERG COF

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SECTION 10

Instrumentation Survey

Instrumentation malfunctions, causes and corrective actions are shown in the following table.

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INSTRUMENTATION PROBLEM AREAS AND DEVIATIONS			
MALFUNCTIONS			
MEAS NO	DESCRIPTION	REASON	ACTION
F189LT	Run <u>422</u> HF Line at Stub Up	Excessive noise on data trace	Recorder readjusted
	Run <u>424</u>		
	None		
	None		
P1900P	Run <u>426</u> Launcher Inlet LO2	Recorder mech. drive failure	Mechanical drive repaired

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INSTRUMENTATION FAILURE CODE

1. TRANSDUCER

- A. DAMAGED BEFORE TEST
- B. DAMAGED DURING TEST
- C. POWER SUPPLY LOSS
- D. EXCESSIVE ZERO SHIFT IN INSTRUMENTATION SYSTEM
- E. EXCESSIVE GAIN CHANGE IN INSTRUMENTATION SYSTEM
- F. OPEN CIRCUIT
- G. WATER IN TRANSDUCER
- H. SHORTED
- I. EXCESSIVE RANDOM NOISE

- E. 400 CPS DISTURBANCE
- F. NO USEABLE TIMING
- G. NO SPEED LOCK-USED
EXTERNAL SPEED LOCK
- H. NO USEABLE 100 KC
CORRECTION
- I. NO USEABLE VOICE
- J. WRONG TAPE SPEED
- K. FAULTY TAPE

5. TELEMETRY /NOT APPLICABLE/

6. PRE-TEST MEASUREMENT CALIBRATION

2. GRAPHIC RECORDER

- A. DATA PEN NOT WRITING
- B. TIMING PEN NOT WRITING
- C. PAPER DRIVE STOPPAGE
- D. RAN OUT OF PAPER DURING TEST
- E. EXCESSIVE RANDOM NOISE
- F. NO TIMING
- G. OFF SCALE
- H. PAPER DRIVE ON SLOW SPEED

- A. NEVER CALIBRATED
- B. NO USEABLE ZERO LEVEL
- C. NO USEABLE SENSE STEPS
- D. CALIBRATION NOT RECEIVED
FROM TEST SITE
- E. CALIBRATION SUSPECTED TO BE
INVALID

7. INSTRUMENTATION PROCEDURE

3. OSCILLOGRAPHIC

- A. EXCESSIVE RANDOM NOISE
- B. BAD GALVANOMETER
- C. NO TIMING LINES
- D. NO TRACE IDENTIFIERS
- E. GALVANOMETER NOT SUITABLE
- F. RAN OUT OF PAPER DURING TEST
- G. PAPER DRIVE FAILURE
- H. NO TIMING CORRELATION

- A. WIRING REVERSED
- B. CALIBRATION RANGE INADEQUATE
- C. SYSTEM SENSITIVITY TOO HIGH
- D. SYSTEM SENSITIVITY TOO LOW
- E. IMPOSSIBLE TO MAKE MEASURE-
MENT
- F. MEASUREMENT NOT ATTEMPTED
- G. IMPROPER WIRING CONNECTION

8. MISCELLANY

4. MAGNETIC TAPE RECORDERS

- A. SIGNAL OUT OF BAND
- B. EXCESSIVE SIGNAL DROPOUT
- C. EXCESSIVE RANDOM NOISE
- D. 60 CPS DISTURBANCE

- A. RECORD DAMAGED AT TEST SITE
- B. RECORD DAMAGED IN TEG
- C. RECORD NOT SENT TO TEG
- D. RECORD LOST IN TEG
- E. RECORD NOT IDENTIFIED AT SITE
- F. OSCILLOGRAPH DEVELOPMENT
FAULTY
- G. TRANSDUCER NOT MOUNTED
PROPERLY
- H. TRANSDUCER MNTD AT WRONG PLACE

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Tables and Figures

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TABLE 1

GO2 Sample Data

Run 423

<u>Sample No.</u>	<u>% Tank Level</u> D - Detanking T - Tanking	<u>Press.</u>	<u>% HE</u>	<u>% O2**</u>	<u>% N2**</u>
2	T-30	32	18.6	99.3	.7
4	T-80	28	28.0	98.1	1.9
1	D-95	12	44.6	99.1	.9
5	D-80	9	66.9	99.0	1.0
6	D-60	11	51.1	99.4	.6
7	D-40	10	42.9	99.3	.7
8	D-20	8	66.2	99.0	1.0
3*					

* Sample number 3 was inoperative for this run.

**% O2 and N2 are shown in % of remaining sample after HE is removed.

<u>LO2 Storage Tank Sample:</u>	<u>% O2</u>	<u>% N2</u>
Before Run 423	99.4	.6
After Run 423	99.8	.2

Run 424

<u>Sample No.</u>	<u>% Tank Level</u> D - Detanking T - Tanking	<u>Press.</u>	<u>% HE</u>	<u>% O2**</u>	<u>% N2**</u>
1	T-30	30	14.8	99.3	.7
2	T-80	20	29.2	98.7	1.3
5	D-95	11	55.9	99.4	.6
6	D-80	14	44.0	99.3	.7
7	D-60	12	44.3	99.4	.6
8	D-40	12	46.8	98.4	1.6
4	D-20	9	51.8	99.3	.7
3*					

* Sample number 3 was inoperative for this run.

**% O2 and N2 are shown in % of remaining sample after HE is removed.

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TABLE 1 (Continued)

LO2 Storage Tank Sample:	<u>% O2</u>	<u>% N2</u>
Before Run 424	99.7	.3
After Run 424	99.8	.2

Run 425

<u>Sample No.</u>	<u>% Tank Level</u> D - Detanking T - Tanking	<u>Press.</u>	<u>% HE</u>	<u>% O2**</u>	<u>% N2**</u>
1	T-30	30	22.1	99.4	.6
2	T-80	30	23.1	99.1	.9
5	D-95	27	32.1	99.2	.8
6	D-80	30	21.1	99.5	.5
7	D-60	34	21.2	99.2	.8
8	D-40	37	30.3	99.2	.8
4	D-20	32	22.4	98.9	1.1
3*					

* Sample number 3 was inoperative for this run.
**% O2 and N2 are shown in % of remaining sample after HE is removed.

LO2 Storage Tank Sample:	<u>% O2</u>	<u>% N2</u>
Before Run 425	99.8	.2
After Run 425	99.7	.3

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TABLE 2 -- HE/LN2 SYSTEM PERFORMANCE DATA -- RUN 423

A. LN2 Flow Data			
1. LN2 Flow Rate (Fl105R)			
a. High flow rate	(GPM)	86	
b. High flow duration	(MIN)	13	
c. Topping flow rate	(GPM)	3.8	
d. Topping flow duration	(MIN)	15	
2. LN2 St Tk (Fl177OP)	(PSIG)	88	
B. Helium Flow Data			
1. Set Point	(PSIG)	6.7	
2. B Btl Avg Flow Rate	(LBS/MIN)	15.0	
3. S Btl Avg Flow Rate	(LBS/MIN)	N/A	
4. Ctl Btl Avg Flow Rate	(LBS/MIN)	.5	
5. Avg Tot Flow Rate	(LBS/MIN)	-	
C. Data at 11 Minutes			
1. B Btl Temp			
a. Fl247T	(DGF)	-288	
b. Fl297T	(DGF)	-298	
2. B Btl Press	(PSIG)	2780	
3. S Btl Temp	(DGF)	Deleted	
4. S Btl Press	(PSIG)	2760	
5. Ctl Btl Temp	(DGF)	28	
6. Ctl Btl Press		2740	
D. Data at 13 Minutes			
1. B Btl Temp			
a. Fl247T	(DGF)	-295	
b. Fl297T	(DGF)	-304	
2. B Btl Press	(PSIG)	3060	
3. S Btl Temp	(DGF)	Deleted	
4. S Btl Press	(PSIG)	3030	
5. Ctl Btl Temp	(DGF)	22	
6. Ctl Btl Press	(PSIG)	3060	
E. Data Prior to HE Dump			
1. B Btl Temp			
a. Fl247T	(DGF)	-301	
b. Fl297T	(DGF)	(-326)	
2. B Btl Press	(PSIG)	3050	
3. S Btl Temp	(DGF)	Deleted.	
4. S Btl Press	(PSIG)	2490	
5. Ctl Btl Temp	(DGF)	41	
6. Ctl Btl Press	(PSIG)	3040	
F. Temperature at Test Start			
1. Fl247T B Tk HE Btl	(DGF)	83	
2. Fl297T B Tk HE Btl	(DGF)	82	
3. Fl249T S Tk HE Btl	(DGF)	Deleted.	
4. Fl290T Ctl Tk HE Btl	(DGF)	99	
5. Fl297T Eng Comp Amb by 304	(DGF)	85	
6. P 298T V Ctl Man Env	(DGF)	91	
7. P 298T V Ctl Man Metal	(DGF)	90	
G. Other Data			
1. Time to Dump Start	(Min.)	0.05	
2. Press at Above Time	(PSIG)	2550	
3. B Btl Temp at Above Time			
a. Fl247T	(DGF)	-274	
b. Fl297T	(DGF)	-287	
4. Helium Loading Delay	(MIN)	3	

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TABLE 3

Fuel Tank Temperature Data

<u>Test No.</u>	<u>Fuel Tank Helium F1004T</u>		<u>Amb Temp DGF</u>	<u>Acoustica Performance</u>
	<u>Pre Test</u> DGF	<u>Max DGF</u> @ Time in Min.		
417	104	132 @ 3.0	92	Satisfactory
418	122	*150 @ 3.0	106	Satisfactory
419	105	146 @ 2.3	100.5	Satisfactory
420	105	*150 @ 3.0	88	Fuel 95% probe failed
421	108	*150 @ 2.0	94	Satisfactory
422	120	*150 @ 1.4	104	Satisfactory
423	99	145 @ 2.3	93	Fuel 90% probe failed
424	114	*150 @ 1.7	92	Satisfactory
425	120	*150 @ 2.0	100	L02 90% probe failed
426	128	*150 @ 2.6	102	Satisfactory

* The range of this recorder does not exceed 150 DGF so these temperatures are higher than the system is capable of measuring.

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TABLE 4 - ACOUSTIC PERFORMANCE RUN 423

CONTROL SENSOR	MISSILE STATION NUMBER			PERCENT OF FULL TANK			U1091V Error Demod
	Total DP Indication	Partial DP Indication	Per Print	Total DP Indication	Partial DP Indication	Per Print	
90% Probe	578.2		582.4	89.4	90.2	90.5**	
95% Probe	*		549.8	94.5			
99.8% Probe	504.3	502.2	503.3	99.8	99.7	99.8	104.1**
L02 Topping	*		500.5	100.0			
L02 Overfill	*		496.0	100.4			
String A							
6	909.8		910.3	6.3	6.4		
5	887.2		887.8	11.9	12.3		
4	*		865.8	18.0			
3	*		762.8	37.1			
2	589.8		700.5	61.2	64.0		
90% Fuel	1166.8		951.0	90.3	3.9		
95% Fuel	*		948.0	95.3			
100% Fuel	932.5	934	933.0	100.0	100.1	99.7	
100.2% Fuel	*						

* These probes did not signal during this test.

** These figures are calculated to indicate actual propellant level.

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TABLE 5 - ACOUSTICA PERFORMANCE RUN 424

CONTROL SENSOR	MISSILE STATION NUMBER		PERCENT OF FULL TANK		Partial DP Indication	U1091V Error Demod
	Total DP Indication	Partial DP Indication	Per Print	Total DP Indication		
90% Probe	578.2		89.4	90.2		90.8**
95% Probe	*		94.5			
99% Probe	517.1	515.3	98.4	98.4	98.6	102.5**
L02 Topring	*		100.0			
L02 Overfill	*		100.4			
String A						
6	909.8		6.3	6.4		
5	887.2		11.9	12.3		
4	*		18.0			
3	*		37.1			
2	292.8		61.2	63.2		
90% Fuel	962.7	964.2	90.3	89.3	88.4	
95% Fuel	*		95.3			
100% Fuel	932.5	933.8	100.0	100.1	99.8	
100.2% Fuel	*					

* These probes did not signal during this test.

** These figures are calculated to indicate actual propellant level.

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TABLE 6 - ACOUSTICA PERFORMANCE RUN 425

CONTROL SENSOR	MISSILE STATION NUMBER		PERCENT OF FULL TANK				U1091V Error Demod
	Total DP Indication	Partial DP Indication	Per Print	Total DP Indication	Partial DP Indication		
90% Probe	674.3		89.4	68.1			
95% Probe	*		95.5				
99% Probe	517.6	517.1	98.4	98.3	98.6		102.5**
L02 Topping	*		100.0				
L02 Overfill	*		100.4				
String A							
6	907.3		6.3	7.1			
5	886.7		11.9	12.5			
4	*		18.0				
3	*		37.1				
2	691.8		61.2	63.5			
90% Fuel	961.4	963.5	90.3	90.0	89.0		
95% Fuel	*		95.3				
100% Fuel	931.7	934.6	100.0	100.5	99.5		
100.2% Fuel	*						

* These probes did not signal during this test.

** These figures are calculated to indicate actual propellant level.

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TABLE 7 - ACOUSTICA PERFORMANCE RUN 426

CONTROL SENSOR	MISSILE STATION NUMBER		PERCENT OF FULL TANK		Partial DP Indication	U1901V Error Demod
	Total DP Indication	Partial DP Indication	Per Print	Total DP Indication		
90% Probe	582.3		89.4	38.7		87.2**
95% Probe	*		95.5			
99% Probe	517.6	517.3	98.4	98.3	98.4	102.4**
L02 Topping	*		100.5			
L02 Overfill	*		496.0			
String A						
6	907.3		6.3	7.1		
5	885.8		11.9	12.7		
4	*		18.0			
3	*		37.1			
2	94.3		61.2	62.8		
90% Fuel	958.5	962.5	90.3	91.1	89.5	
95% Fuel	*		95.3			
100% Fuel	932.0	934.5	100.0	100.1	99.6	
100.2% Fuel	*					

* These probes did not signal during this test.

** These figures are calculated to indicate actual propellant level.

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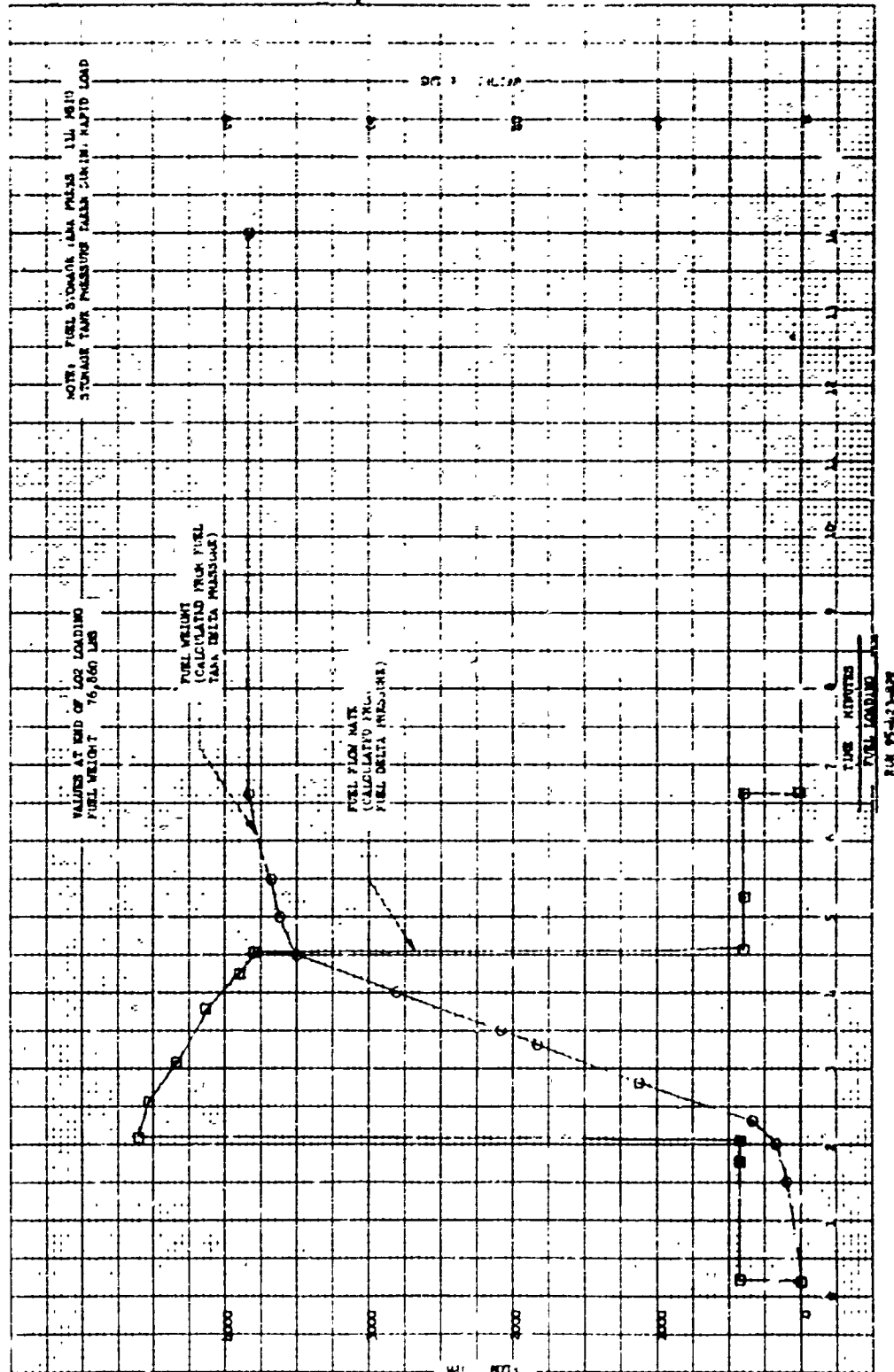
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Figure 1 - Fuel Loading System



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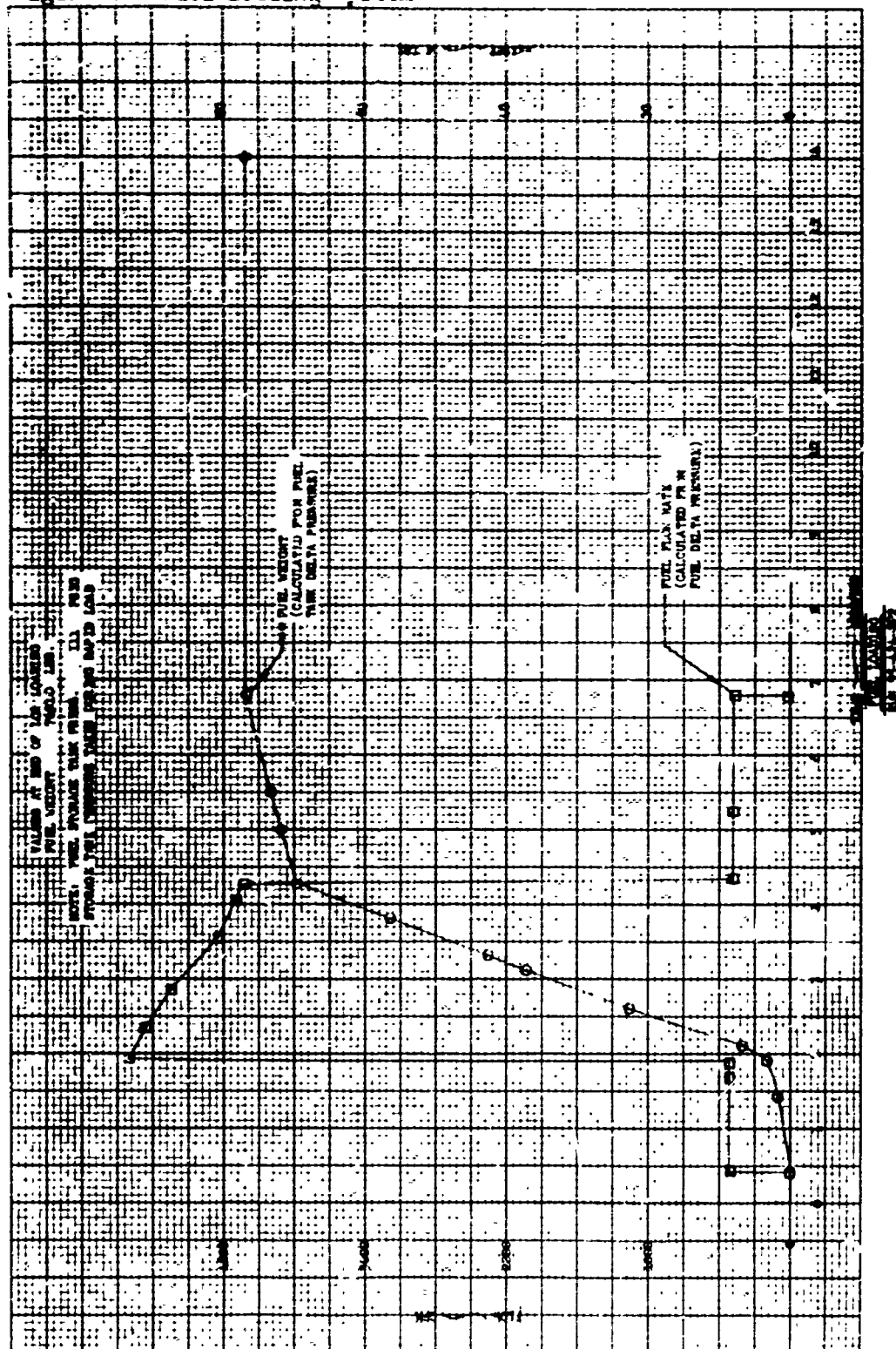
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Figure 2 - Fuel Loading System



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NOTE: LO2 STORAGE TANK PRESS. 101.7 PSIG
STORAGE TANK PRESSURE TAKEN DURING RAPID LOAD
"LITES AT END OF LAZ LOADING
LO2 WEIGHT 175,700 LBS
LO2 TOPPING FLOW RATE

LOG FLOW RATE
(CALCULATED FROM
LOG DELTA PRESSURE)

LO2 VIT. LIT.
(CALCULATED FROM LO2
TANK DELTA PRESSURE)

COOLDOWN START

TIME - MINUTES

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NOTE: LOG STORAGE TANK PRESS. 106 P33
STORAGE TANK PRESSURE TANK FOR DRY DAP ID LOAD.

VALUES AT END OF LOG LOADING
LOG WEIGHT 172.50 LBS
LOG TAPPING FLOWMETER TEMPERATURE
APPROX. FLOW 25.0 GPM

LOG WEIGHT
(CALCULATED FROM LOG
TANK DILTA PRESSURE)

LOG WEIGHT
(CALCULATED FROM
LOG TANK DILTA PRESSURE)

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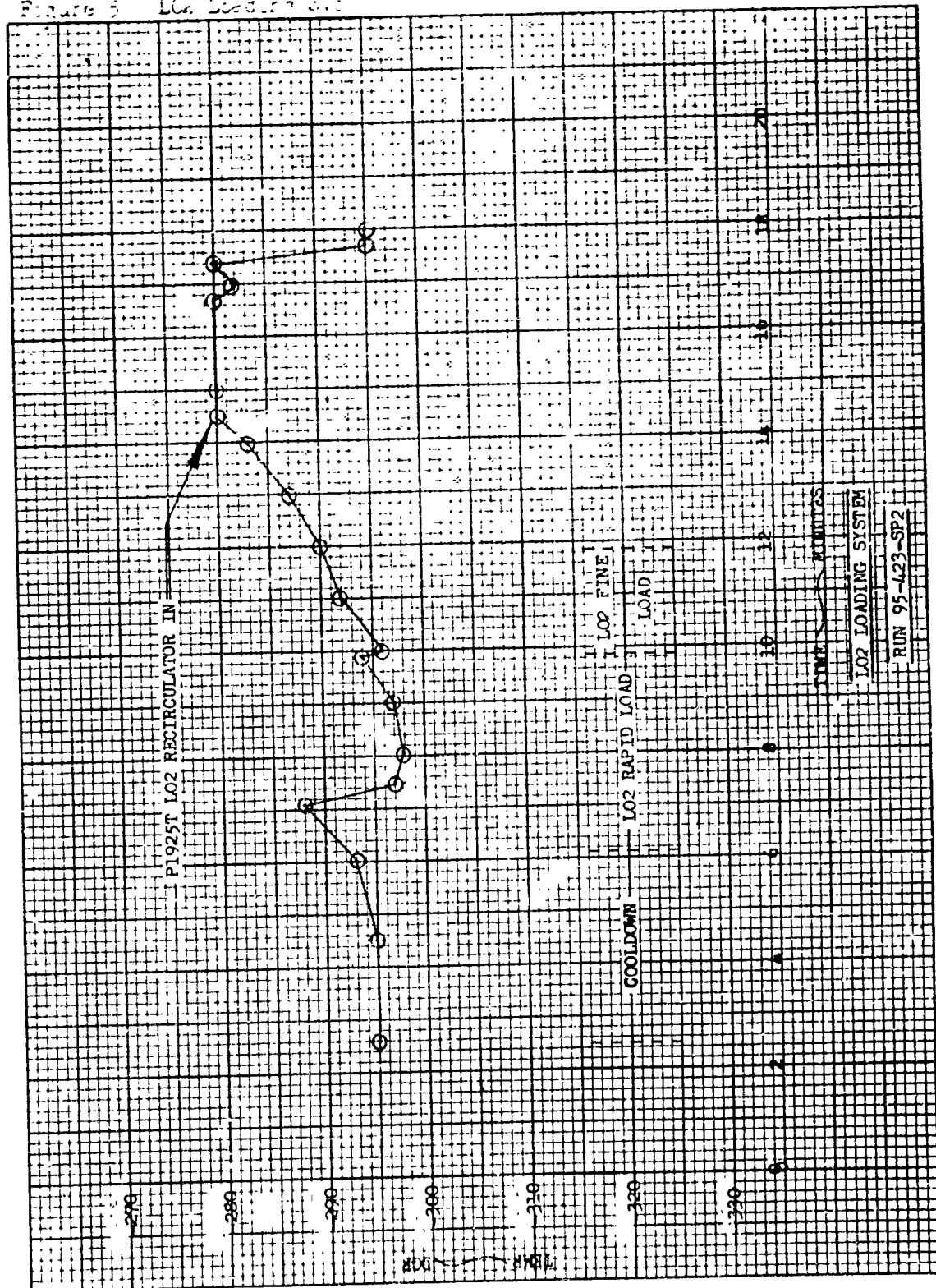
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Figure 5 LO2 Loading Svc



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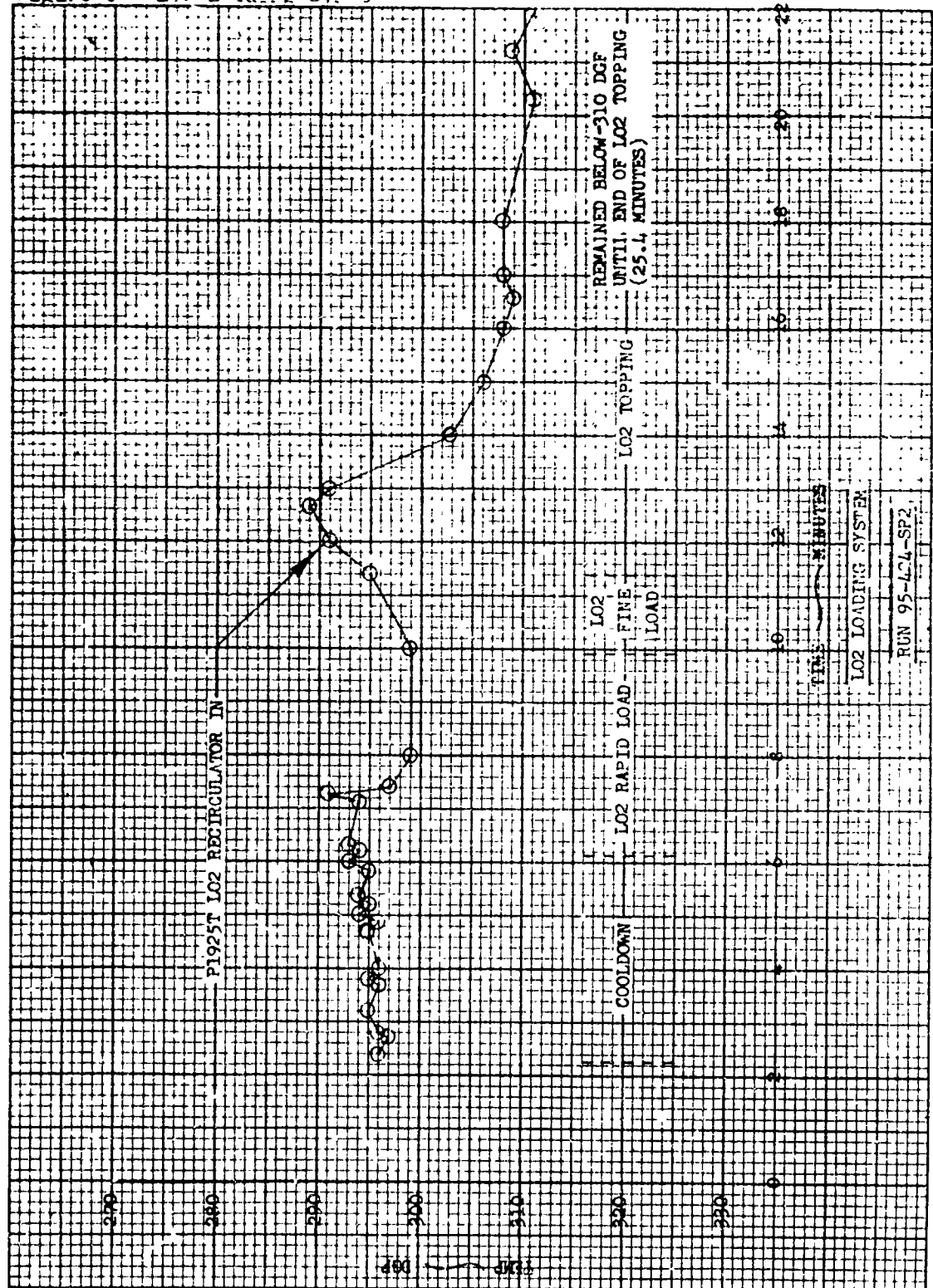
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Figure 5 L2 Loading System



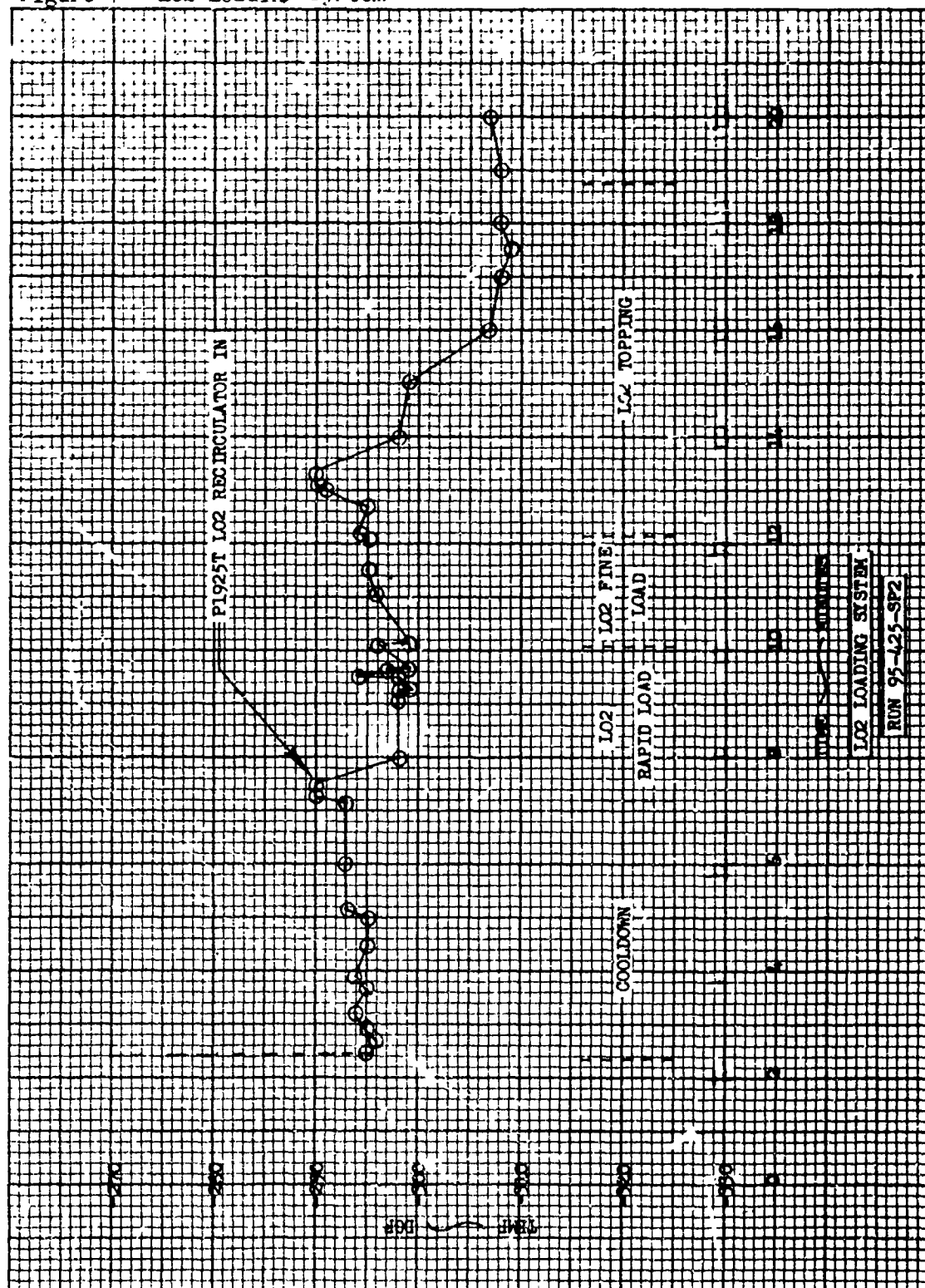
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Figure 1 - LO2 Loading System



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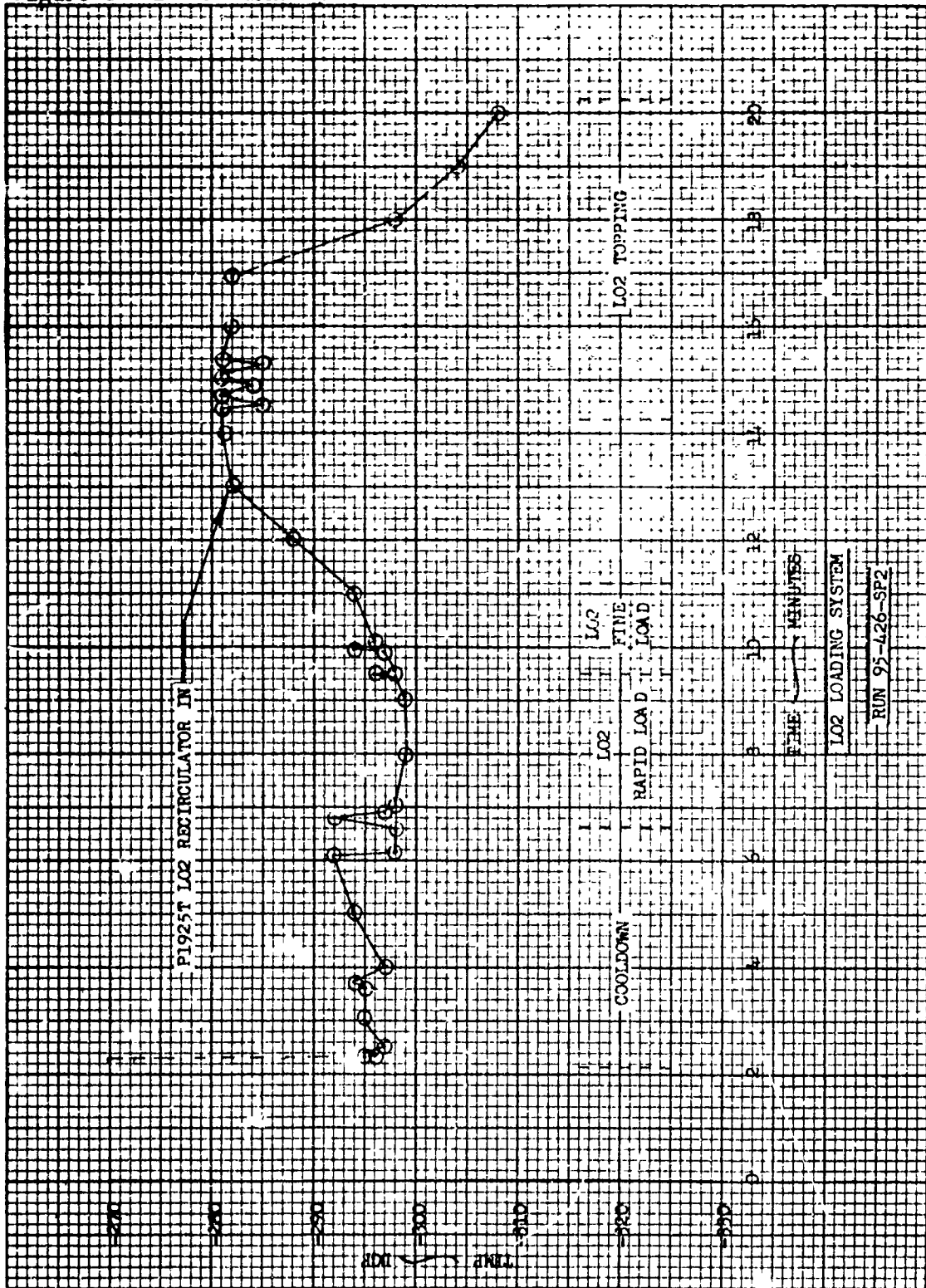
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Figure 8



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RED LINE VALUES EXCEEDED

No red line values were exceeded during Runs 423, 424, 425 and 426. Red line values are tabulated in Test Directive ETD-OPH-5.

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